



SEQUENCE LISTING

<110> YANAI, Koji
OKAKURA, Kaoru
YASUDA, Shohei
WATANABE, Manabu
MIYAMOTO, Koichi
MIDOH, Naoki
MURAKAMI, Takeshi

<120> Transformants producing secondary metabolites
modified with functional groups, and novel
biosynthesis genes

<130> 2002-0451A/LC/00144

<140> NEW

<141> 2002-03-29

<150> JP 11-276314

<151> 1999-09-29

<160> 23

<170> PatentIn Ver. 2.1

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<211> 2061

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<213> Streptomyces venezuelae

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| Met | Arg | Thr | Leu | Leu | Ile | Asp | Asn | Tyr | Asp | Ser | Phe | Thr | His | Asn | Leu | |
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| ttc | cag | tac | atc | ggc | gag | gcc | acc | ggg | caa | ccc | ccc | gtc | gtc | gtg | ccc | 96 |
| Phe | Gln | Tyr | Ile | Gly | Glu | Ala | Thr | Gly | Gln | Pro | Pro | Val | Val | Val | Pro | |
| | | | 20 | | | | | 25 | | | | | | 30 | | |
| aac | gac | gcc | gac | tgg | tgc | cgg | ctg | ccc | gtc | gag | gac | ttc | gac | gcg | atc | 144 |
| Asn | Asp | Ala | Asp | Trp | Ser | Arg | Leu | Pro | Val | Glu | Asp | Phe | Asp | Ala | Ile | |
| | | 35 | | | | | 40 | | | | | 45 | | | | |
| gtc | gtg | tcc | ccg | ggc | ccc | ggc | agc | ccc | gac | cgg | gaa | cgg | gac | ttc | gga | 192 |
| Val | Val | Ser | Pro | Gly | Pro | Gly | Ser | Pro | Asp | Arg | Glu | Arg | Asp | Phe | Gly | |
| | | 50 | | | | 55 | | | | | 60 | | | | | |
| atc | agc | cgc | cgg | gcg | atc | acc | gac | agc | ggc | ctg | ccc | gtc | ctc | ggc | gtc | 240 |
| Ile | Ser | Arg | Arg | Ala | Ile | Thr | Asp | Ser | Gly | Leu | Pro | Val | Leu | Gly | Val | |
| 65 | | | | | 70 | | | | | 75 | | | | | 80 | |
| tgc | ctc | ggc | cac | cag | ggc | atc | gcc | cag | ctc | ttc | ggc | gga | acc | gtc | ggc | 288 |

| Cys | Leu | Gly | His | Gln | Gly | Ile | Ala | Gln | Leu | Phe | Gly | Gly | Thr | Val | Gly | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | | | | 85 | | | | | 90 | | | | | 95 | | |
| ctc | gcc | ccg | gaa | ccc | atg | cac | ggc | cgg | gtc | tcc | gag | gtg | cgg | cac | acc | 336 |
| Leu | Ala | Pro | Glu | Pro | Met | His | Gly | Arg | Val | Ser | Glu | Val | Arg | His | Thr | |
| | | | 100 | | | | | 105 | | | | | 110 | | | |
| ggc | gag | gac | gtc | ttc | cgg | ggc | ctc | ccc | tgc | ccg | ttc | acc | gcc | gtg | cgc | 384 |
| Gly | Glu | Asp | Val | Phe | Arg | Gly | Leu | Pro | Ser | Pro | Phe | Thr | Ala | Val | Arg | |
| | | 115 | | | | | 120 | | | | | 125 | | | | |
| tac | cac | tcc | ctg | gcc | gcc | acc | gac | ctc | ccc | gac | gag | ctc | gaa | ccc | ctc | 432 |
| Tyr | His | Ser | Leu | Ala | Ala | Thr | Asp | Leu | Pro | Asp | Glu | Leu | Glu | Pro | Leu | |
| | 130 | | | | | 135 | | | | | 140 | | | | | |
| gcc | tgg | agc | gac | gac | ggg | gtc | gtc | atg | ggc | ctg | cgg | cac | cgc | gag | aag | 480 |
| Ala | Trp | Ser | Asp | Asp | Gly | Val | Val | Met | Gly | Leu | Arg | His | Arg | Glu | Lys | |
| 145 | | | | | 150 | | | | 155 | | | | | 160 | | |
| ccg | ctg | tgg | ggc | gtc | cag | ttc | cac | ccg | gag | tcc | atc | ggc | agc | gac | ttc | 528 |
| Pro | Leu | Trp | Gly | Val | Gln | Phe | His | Pro | Glu | Ser | Ile | Gly | Ser | Asp | Phe | |
| | | | 165 | | | | | 170 | | | | | | 175 | | |
| ggc | cgg | gag | atc | atg | gcc | aac | ttc | cgc | gac | ctc | gcc | ctc | gcc | cac | cac | 576 |
| Gly | Arg | Glu | Ile | Met | Ala | Asn | Phe | Arg | Asp | Leu | Ala | Leu | Ala | His | His | |
| | | | 180 | | | | | 185 | | | | | 190 | | | |
| cgg | gca | cgg | cgc | cac | ggg | gcc | gac | tcc | ccg | tac | gaa | ctc | cac | gtg | cgc | 624 |
| Arg | Ala | Arg | Arg | His | Gly | Ala | Asp | Ser | Pro | Tyr | Glu | Leu | His | Val | Arg | |
| | | 195 | | | | | 200 | | | | | 205 | | | | |
| cgc | gtc | gac | gtg | ctg | ccg | gac | gcc | gaa | gag | gta | cgc | cgc | ggc | tgc | ctg | 672 |
| Arg | Val | Asp | Val | Leu | Pro | Asp | Ala | Glu | Glu | Val | Arg | Arg | Gly | Cys | Leu | |
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| ccc | ggc | gag | ggc | acc | acg | ttc | tgg | ctg | gac | agc | agc | tcc | gtc | ctc | gaa | 720 |
| Pro | Gly | Glu | Gly | Thr | Thr | Phe | Trp | Leu | Asp | Ser | Ser | Ser | Val | Leu | Glu | |
| 225 | | | | 230 | | | | | 235 | | | | | 240 | | |
| ggc | gcc | tgc | cgc | ttc | tcc | ttc | ctc | ggc | gac | gac | cgc | ggc | ccg | ctc | gcc | 768 |
| Gly | Ala | Ser | Arg | Phe | Ser | Phe | Leu | Gly | Asp | Asp | Arg | Gly | Pro | Leu | Ala | |
| | | | 245 | | | | | 250 | | | | | | 255 | | |
| gag | tac | ctc | acc | tac | cgc | gtc | gcc | gac | ggc | gtc | gtc | tcc | gtc | cgc | ggc | 816 |
| Glu | Tyr | Leu | Thr | Tyr | Arg | Val | Ala | Asp | Gly | Val | Val | Ser | Val | Arg | Gly | |
| | | 260 | | | | | 265 | | | | | 270 | | | | |
| tcc | gac | ggc | acc | acg | acc | cgg | acg | cgg | cgc | ccc | ttc | ttc | aac | tac | ctg | 864 |
| Ser | Asp | Gly | Thr | Thr | Thr | Arg | Thr | Arg | Arg | Pro | Phe | Phe | Asn | Tyr | Leu | |
| | | 275 | | | | | 280 | | | | | 285 | | | | |
| gag | gag | cag | ctc | gaa | cgc | cga | cgg | gtc | ccc | gtc | gcc | ccc | gaa | ctg | ccc | 912 |
| Glu | Glu | Gln | Leu | Glu | Arg | Arg | Arg | Val | Pro | Val | Ala | Pro | Glu | Leu | Pro | |
| | 290 | | | | | 295 | | | | | 300 | | | | | |
| ttc | gag | ttc | aac | ctc | ggc | tac | gtc | ggc | tac | ctc | ggc | tac | gag | ctg | aag | 960 |
| Phe | Glu | Phe | Asn | Leu | Gly | Tyr | Val | Gly | Tyr | Leu | Gly | Tyr | Glu | Leu | Lys | |

| 305 | 310 | 315 | 320 | |
|---|-----|-----|-----|------|
| gcg gag acc acc ggc gac ccc gcg cac cgg tcc ccg cac ccc gac gcc Ala Glu Thr Thr Gly Asp Pro Ala His Arg Ser Pro His Pro Asp Ala 325 330 335 | | | | 1008 |
| gcg ttc ctc ttc gcc gac cgc gcc atc gcc ctc gac cac cag gaa ggc Ala Phe Leu Phe Ala Asp Arg Ala Ile Ala Leu Asp His Gln Glu Gly 340 345 350 | | | | 1056 |
| tgc tgc tac ctg ctg gcc ctc gac cgc cgg ggc cac gac gac ggc gcc Cys Cys Tyr Leu Leu Ala Leu Asp Arg Arg Gly His Asp Asp Gly Ala 355 360 365 | | | | 1104 |
| cgc gcc tgg ctg cgg gag acg gcc gag acc ctc acc ggc ctg gcc gtc Arg Ala Trp Leu Arg Glu Thr Ala Glu Thr Leu Thr Gly Leu Ala Val 370 375 380 | | | | 1152 |
| cgc gcc ccg gcc gag ccg acc ccc gcc atg gtc ttc ggg atc ccc gag Arg Ala Pro Ala Glu Pro Thr Pro Ala Met Val Phe Gly Ile Pro Glu 385 390 395 400 | | | | 1200 |
| gcg gcg gcc ggc ttc ggc ccc ctg gcc cgc gcg cgc cac gac aag gac Ala Ala Ala Gly Phe Gly Pro Leu Ala Arg Ala Arg His Asp Lys Asp 405 410 415 | | | | 1248 |
| gcc tac ctc aag cgc atc gac gag tgc ctc aag gag atc cgc aac ggc Ala Tyr Leu Lys Arg Ile Asp Glu Cys Leu Lys Glu Ile Arg Asn Gly 420 425 430 | | | | 1296 |
| gag tcg tac gag atc tgc ctg acc aac atg gtc acc gcg ccg acc gag Glu Ser Tyr Glu Ile Cys Leu Thr Asn Met Val Thr Ala Pro Thr Glu 435 440 445 | | | | 1344 |
| gcg acg gcc ctg ccg ctc tac tcc gcg ctg cgc gcc atc agc ccc gtc Ala Thr Ala Leu Pro Leu Tyr Ser Ala Leu Arg Ala Ile Ser Pro Val 450 455 460 | | | | 1392 |
| ccg tac ggc gcc ctg ctc gag ttc ccc gaa ctg tcg gtg ctg agc gcc Pro Tyr Gly Ala Leu Leu Glu Phe Pro Glu Leu Ser Val Leu Ser Ala 465 470 475 480 | | | | 1440 |
| tcg ccc gag cgg ttc ctc acg atc ggc gcc gac ggc ggc gtc gag tcc Ser Pro Glu Arg Phe Leu Thr Ile Gly Ala Asp Gly Gly Val Glu Ser 485 490 495 | | | | 1488 |
| aag ccc atc aag ggg acc cgc ccc cgg ggc ggc acc gcg gag gag gac Lys Pro Ile Lys Gly Thr Arg Pro Arg Gly Gly Thr Ala Glu Glu Asp 500 505 510 | | | | 1536 |
| gag cgg ctc cgc gcc gac ctg gcc ggc cgg gag aag gac ccg gcc gag Glu Arg Leu Arg Ala Asp Leu Ala Gly Arg Glu Lys Asp Arg Ala Glu 515 520 525 | | | | 1584 |
| aac ctg atg atc gtc gac ctg gtc cgc aac gac ctc aac agc gtc tgc Asn Leu Met Ile Val Asp Leu Val Arg Asn Asp Leu Asn Ser Val Cys 530 535 540 | | | | 1632 |

| | |
|---|------|
| gcg atc ggc tcc gtc cac gtg ccc cgg ctc ttc gag gtg gag acc tac | 1680 |
| Ala Ile Gly Ser Val His Val Pro Arg Leu Phe Glu Val Glu Thr Tyr | |
| 545 550 555 560 | |
| | |
| gcg ccc gtg cac cag ctg gtg tcg acc atc cgg gga cgg ctg cgg ccc | 1728 |
| Ala Pro Val His Gln Leu Val Ser Thr Ile Arg Gly Arg Leu Arg Pro | |
| 565 570 575 | |
| | |
| ggc acc agc acc gcc gcc tgc gta cgc gcc gcc ttc ccc ggc ggc tcc | 1776 |
| Gly Thr Ser Thr Ala Ala Cys Val Arg Ala Ala Phe Pro Gly Gly Ser | |
| 580 585 590 | |
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| atg acc ggc ggc ccc aag aag cgc acc atg gag atc atc gac cgc ctg | 1824 |
| Met Thr Gly Ala Pro Lys Lys Arg Thr Met Glu Ile Ile Asp Arg Leu | |
| 595 600 605 | |
| | |
| gag gaa ggc ccc cgg ggc gtc tac tcc ggg ggc ctc gga tgg ttc gcc | 1872 |
| Glu Glu Gly Pro Arg Gly Val Tyr Ser Gly Ala Leu Gly Trp Phe Ala | |
| 610 615 620 | |
| | |
| ctc agc ggc gcc gcc gac ctc agc atc gtc atc cgc acc atc gtg ctg | 1920 |
| Leu Ser Gly Ala Ala Asp Leu Ser Ile Val Ile Arg Thr Ile Val Leu | |
| 625 630 635 640 | |
| | |
| gcc gac ggc cag gcg gag ttc ggc gtc ggc ggg gcg atc gtg tcc ctc | 1968 |
| Ala Asp Gly Gln Ala Glu Phe Gly Val Gly Gly Ala Ile Val Ser Leu | |
| 645 650 655 | |
| | |
| tcc gac cag gag gag gag ttc acc gag acc gtg gta aag gcc cgc gcc | 2016 |
| Ser Asp Gln Glu Glu Glu Phe Thr Glu Thr Val Val Lys Ala Arg Ala | |
| 660 665 670 | |
| | |
| atg gtc acc gcc ctc gac ggc agc gcc gtg gcg ggc gcc cga tga | 2061 |
| Met Val Thr Ala Leu Asp Gly Ser Ala Val Ala Gly Ala Arg | |
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 35 40 45
 Val Val Ser Pro Gly Pro Gly Ser Pro Asp Arg Glu Arg Asp Phe Gly
 50 55 60
 Ile Ser Arg Arg Ala Ile Thr Asp Ser Gly Leu Pro Val Leu Gly Val

| | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|
| 65 | | | | | 70 | | | | | | 75 | | | | | 80 |
| Cys | Leu | Gly | His | Gln | Gly | Ile | Ala | Gln | Leu | Phe | Gly | Gly | Thr | Val | Gly | |
| | | | | 85 | | | | | 90 | | | | | 95 | | |
| Leu | Ala | Pro | Glu | Pro | Met | His | Gly | Arg | Val | Ser | Glu | Val | Arg | His | Thr | |
| | | | 100 | | | | | 105 | | | | | 110 | | | |
| Gly | Glu | Asp | Val | Phe | Arg | Gly | Leu | Pro | Ser | Pro | Phe | Thr | Ala | Val | Arg | |
| | | 115 | | | | | 120 | | | | | 125 | | | | |
| Tyr | His | Ser | Leu | Ala | Ala | Thr | Asp | Leu | Pro | Asp | Glu | Leu | Glu | Pro | Leu | |
| | 130 | | | | | 135 | | | | | 140 | | | | | |
| Ala | Trp | Ser | Asp | Asp | Gly | Val | Val | Met | Gly | Leu | Arg | His | Arg | Glu | Lys | |
| 145 | | | | | 150 | | | | | 155 | | | | | 160 | |
| Pro | Leu | Trp | Gly | Val | Gln | Phe | His | Pro | Glu | Ser | Ile | Gly | Ser | Asp | Phe | |
| | | | | 165 | | | | | 170 | | | | | 175 | | |
| Gly | Arg | Glu | Ile | Met | Ala | Asn | Phe | Arg | Asp | Leu | Ala | Leu | Ala | His | His | |
| | | | 180 | | | | | 185 | | | | | 190 | | | |
| Arg | Ala | Arg | Arg | His | Gly | Ala | Asp | Ser | Pro | Tyr | Glu | Leu | His | Val | Arg | |
| | | 195 | | | | | 200 | | | | | 205 | | | | |
| Arg | Val | Asp | Val | Leu | Pro | Asp | Ala | Glu | Glu | Val | Arg | Arg | Gly | Cys | Leu | |
| | 210 | | | | | 215 | | | | | 220 | | | | | |
| Pro | Gly | Glu | Gly | Thr | Thr | Phe | Trp | Leu | Asp | Ser | Ser | Ser | Val | Leu | Glu | |
| 225 | | | | | 230 | | | | | 235 | | | | 240 | | |
| Gly | Ala | Ser | Arg | Phe | Ser | Phe | Leu | Gly | Asp | Asp | Arg | Gly | Pro | Leu | Ala | |
| | | | | 245 | | | | | 250 | | | | | 255 | | |
| Glu | Tyr | Leu | Thr | Tyr | Arg | Val | Ala | Asp | Gly | Val | Val | Ser | Val | Arg | Gly | |
| | | | 260 | | | | | 265 | | | | | 270 | | | |
| Ser | Asp | Gly | Thr | Thr | Thr | Arg | Thr | Arg | Arg | Pro | Phe | Phe | Asn | Tyr | Leu | |
| | | 275 | | | | | 280 | | | | | 285 | | | | |
| Glu | Glu | Gln | Leu | Glu | Arg | Arg | Arg | Val | Pro | Val | Ala | Pro | Glu | Leu | Pro | |
| | 290 | | | | | 295 | | | | | 300 | | | | | |
| Phe | Glu | Phe | Asn | Leu | Gly | Tyr | Val | Gly | Tyr | Leu | Gly | Tyr | Glu | Leu | Lys | |
| 305 | | | | | 310 | | | | | 315 | | | | | 320 | |
| Ala | Glu | Thr | Thr | Gly | Asp | Pro | Ala | His | Arg | Ser | Pro | His | Pro | Asp | Ala | |
| | | | | 325 | | | | | 330 | | | | | 335 | | |
| Ala | Phe | Leu | Phe | Ala | Asp | Arg | Ala | Ile | Ala | Leu | Asp | His | Gln | Glu | Gly | |
| | | | 340 | | | | | 345 | | | | | 350 | | | |
| Cys | Cys | Tyr | Leu | Leu | Ala | Leu | Asp | Arg | Arg | Gly | His | Asp | Asp | Gly | Ala | |
| | | 355 | | | | | 360 | | | | | 365 | | | | |
| Arg | Ala | Trp | Leu | Arg | Glu | Thr | Ala | Glu | Thr | Leu | Thr | Gly | Leu | Ala | Val | |

| 370 | 375 | 380 |
|--|-----|-----|
| Arg Ala Pro Ala Glu Pro Thr Pro Ala Met Val Phe Gly Ile Pro Glu 385 390 395 400 | | |
| Ala Ala Ala Gly Phe Gly Pro Leu Ala Arg Ala Arg His Asp Lys Asp 405 410 415 | | |
| Ala Tyr Leu Lys Arg Ile Asp Glu Cys Leu Lys Glu Ile Arg Asn Gly 420 425 430 | | |
| Glu Ser Tyr Glu Ile Cys Leu Thr Asn Met Val Thr Ala Pro Thr Glu 435 440 445 | | |
| Ala Thr Ala Leu Pro Leu Tyr Ser Ala Leu Arg Ala Ile Ser Pro Val 450 455 460 | | |
| Pro Tyr Gly Ala Leu Leu Glu Phe Pro Glu Leu Ser Val Leu Ser Ala 465 470 475 480 | | |
| Ser Pro Glu Arg Phe Leu Thr Ile Gly Ala Asp Gly Gly Val Glu Ser 485 490 495 | | |
| Lys Pro Ile Lys Gly Thr Arg Pro Arg Gly Gly Thr Ala Glu Glu Asp 500 505 510 | | |
| Glu Arg Leu Arg Ala Asp Leu Ala Gly Arg Glu Lys Asp Arg Ala Glu 515 520 525 | | |
| Asn Leu Met Ile Val Asp Leu Val Arg Asn Asp Leu Asn Ser Val Cys 530 535 540 | | |
| Ala Ile Gly Ser Val His Val Pro Arg Leu Phe Glu Val Glu Thr Tyr 545 550 555 560 | | |
| Ala Pro Val His Gln Leu Val Ser Thr Ile Arg Gly Arg Leu Arg Pro 565 570 575 | | |
| Gly Thr Ser Thr Ala Ala Cys Val Arg Ala Ala Phe Pro Gly Gly Ser 580 585 590 | | |
| Met Thr Gly Ala Pro Lys Lys Arg Thr Met Glu Ile Ile Asp Arg Leu 595 600 605 | | |
| Glu Glu Gly Pro Arg Gly Val Tyr Ser Gly Ala Leu Gly Trp Phe Ala 610 615 620 | | |
| Leu Ser Gly Ala Ala Asp Leu Ser Ile Val Ile Arg Thr Ile Val Leu 625 630 635 640 | | |
| Ala Asp Gly Gln Ala Glu Phe Gly Val Gly Gly Ala Ile Val Ser Leu 645 650 655 | | |
| Ser Asp Gln Glu Glu Glu Phe Thr Glu Thr Val Val Lys Ala Arg Ala 660 665 670 | | |
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 Leu Asp Gly Thr Leu Leu Asp Thr Val Arg Arg Arg Ile Asp Leu Gly
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 gtc cgc atc gcg cgg tac aag tcc cgg cac ggc gtc ccg atg atg cag 144
 Val Arg Ile Ala Arg Tyr Lys Ser Arg His Gly Val Pro Met Met Gln
 35 40 45
 ccc ggc cgg gtc agc ctg gtc aag gac agg gcc gcc cgc tac gcc gcc 192
 Pro Gly Arg Val Ser Leu Val Lys Asp Arg Ala Ala Arg Tyr Ala Ala
 50 55 60
 gac cac ggc ctc gac gaa tcg ttc ctg gtg aac ctc tac gac gtg atc 240
 Asp His Gly Leu Asp Glu Ser Phe Leu Val Asn Leu Tyr Asp Val Ile
 65 70 75 80
 atc acg gag atg tgc cgc gtc gag gac ctg gtg atg agc cgg gag agc 288
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 35 40 45

Pro Gly Arg Val Ser Leu Val Lys Asp Arg Ala Ala Arg Tyr Ala Ala
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Asp His Gly Leu Asp Glu Ser Phe Leu Val Asn Leu Tyr Asp Val Ile
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Gly Gly Met Phe Ala Gly Leu Leu Arg Glu Ala Gly Ser Arg Thr Leu
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gtc gtc gac ctc gta ccg ccg ccg gga cgg ccg gac gcc tgc ctg gtg 144
Val Val Asp Leu Val Pro Pro Pro Gly Arg Pro Asp Ala Cys Leu Val
35 40 45

ggc gac gtc acc gcg ccg ggg ccc gaa ctc gcg gcc gcc ctc cgg gac 192
Gly Asp Val Thr Ala Pro Gly Pro Glu Leu Ala Ala Ala Leu Arg Asp
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gcg gac ctc gtc ctg ctc gcc gta cac gag gac gtg gcc ctc aag gcc 240
Ala Asp Leu Val Leu Leu Ala Val His Glu Asp Val Ala Leu Lys Ala
65 70 75 80

gtg gcg ccc gtg acc cgg ctc atg cgg ccg ggc gcg ctg ctc gcc gac 288
Val Ala Pro Val Thr Arg Leu Met Arg Pro Gly Ala Leu Leu Ala Asp
85 90 95

acc ctg tcc gtc cgg acg ggc atg gcc gcg gag ctc gcg gcc cac gcc 336
Thr Leu Ser Val Arg Thr Gly Met Ala Ala Glu Leu Ala Ala His Ala
100 105 110

ccc ggc gtc cag cac gtg ggc ctc aac ccg atg ttc gcc ccc gcc gcc 384
Pro Gly Val Gln His Val Gly Leu Asn Pro Met Phe Ala Pro Ala Ala
115 120 125

| | |
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| ggc atg acc ggc cga ccc gtg gcc gcc gtg gtc acc agg gac ggg ccg | 432 |
| Gly Met Thr Gly Arg Pro Val Ala Ala Val Val Thr Arg Asp Gly Pro | |
| 130 135 140 | |
| ggc gtc acg gcc ctg ctg cgg ctc gtc gag ggc ggc ggc ggc agg ccc | 480 |
| Gly Val Thr Ala Leu Leu Arg Leu Val Glu Gly Gly Gly Arg Pro | |
| 145 150 155 160 | |
| gta cgg ctc acg gcg gag gag cac gac cgg acg acg gcg gcc acc cag | 528 |
| Val Arg Leu Thr Ala Glu Glu His Asp Arg Thr Thr Ala Ala Thr Gln | |
| 165 170 175 | |
| gcc ctg acg cac gcc gtg ctc ctc tcc ttc ggg ctc gcc ctc gcc cgc | 576 |
| Ala Leu Thr His Ala Val Leu Leu Ser Phe Gly Leu Ala Leu Ala Arg | |
| 180 185 190 | |
| ctc ggc gtc gac gtc cgg gcc ctg gcg gcg acg gca ccg ccg ccc cac | 624 |
| Leu Gly Val Asp Val Arg Ala Leu Ala Ala Thr Ala Pro Pro Pro His | |
| 195 200 205 | |
| cag gtg ctg ctc gcc ctc ctg gcc cgt gtg ctc ggc ggc agc ccc gag | 672 |
| Gln Val Leu Leu Ala Leu Leu Ala Arg Val Leu Gly Gly Ser Pro Glu | |
| 210 215 220 | |
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| Val Tyr Gly Asp Ile Gln Arg Ser Asn Pro Arg Ala Ala Ser Ala Arg | |
| 225 230 235 240 | |
| cgg gcg ctc gcc gag gcc ctg cgc tcc ttc gcc gcg ctg gtc ggc gac | 768 |
| Arg Ala Leu Ala Glu Ala Leu Arg Ser Phe Ala Ala Leu Val Gly Asp | |
| 245 250 255 | |
| gac ccg gac cgt gcc gac gcc ccc ggg cgc gcc gac gcc ccc ggc cat | 816 |
| Asp Pro Asp Arg Ala Asp Ala Pro Gly Arg Ala Asp Ala Pro Gly His | |
| 260 265 270 | |
| ccc ggg gga tgc gac ggc gcc ggg aac ctc gac ggc gtc ttc ggg gaa | 864 |
| Pro Gly Gly Cys Asp Gly Ala Gly Asn Leu Asp Gly Val Phe Gly Glu | |
| 275 280 285 | |
| ctc cgc cgg ctc atg gga ccg gag ctc gcg gcg ggc cag gac cac tgc | 912 |
| Leu Arg Arg Leu Met Gly Pro Glu Leu Ala Ala Gly Gln Asp His Cys | |
| 290 295 300 | |
| cag gag ctg ttc cgc acc ctc cac cgc acc gac gac gaa ggc gag aag | 960 |
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| 305 310 315 320 | |
| gac cga tga | 969 |
| Asp Arg | |

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<400> 6

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1 5 10 15

Gly Gly Met Phe Ala Gly Leu Leu Arg Glu Ala Gly Ser Arg Thr Leu
20 25 30

Val Val Asp Leu Val Pro Pro Pro Gly Arg Pro Asp Ala Cys Leu Val
35 40 45

Gly Asp Val Thr Ala Pro Gly Pro Glu Leu Ala Ala Ala Leu Arg Asp
50 55 60

Ala Asp Leu Val Leu Leu Ala Val His Glu Asp Val Ala Leu Lys Ala
65 70 75 80

Val Ala Pro Val Thr Arg Leu Met Arg Pro Gly Ala Leu Leu Ala Asp
85 90 95

Thr Leu Ser Val Arg Thr Gly Met Ala Ala Glu Leu Ala Ala His Ala
100 105 110

Pro Gly Val Gln His Val Gly Leu Asn Pro Met Phe Ala Pro Ala Ala
115 120 125

Gly Met Thr Gly Arg Pro Val Ala Ala Val Val Thr Arg Asp Gly Pro
130 135 140

Gly Val Thr Ala Leu Leu Arg Leu Val Glu Gly Gly Gly Gly Arg Pro
145 150 155 160

Val Arg Leu Thr Ala Glu Glu His Asp Arg Thr Thr Ala Ala Thr Gln
165 170 175

Ala Leu Thr His Ala Val Leu Leu Ser Phe Gly Leu Ala Leu Ala Arg
180 185 190

Leu Gly Val Asp Val Arg Ala Leu Ala Ala Thr Ala Pro Pro Pro His
195 200 205

Gln Val Leu Leu Ala Leu Leu Ala Arg Val Leu Gly Gly Ser Pro Glu
210 215 220

Val Tyr Gly Asp Ile Gln Arg Ser Asn Pro Arg Ala Ala Ser Ala Arg
225 230 235 240

Arg Ala Leu Ala Glu Ala Leu Arg Ser Phe Ala Ala Leu Val Gly Asp
245 250 255

Asp Pro Asp Arg Ala Asp Ala Pro Gly Arg Ala Asp Ala Pro Gly His
260 265 270

Pro Gly Gly Cys Asp Gly Ala Gly Asn Leu Asp Gly Val Phe Gly Glu
275 280 285

Leu Arg Arg Leu Met Gly Pro Glu Leu Ala Ala Gly Gln Asp His Cys
290 295 300

Gln Glu Leu Phe Arg Thr Leu His Arg Thr Asp Asp Glu Gly Glu Lys
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Asp Arg

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